

multicomponent mixtures based on polyvinyl acetate, vinyl alcohol, organic fillers, alkali silicate (water glass) and calcium ion-supplying compounds. The examiner also sets forth that starch and glycerol are useful ingredients in this process. In examiner's view, the process of the cited prior reference reads on the claimed process of the instant application. The examiner furthermore points out that the quantities of raw materials are also similar to those claimed in the instant application.

The examiner furthermore cites *Krishnan et al.* as disclosing biodegradable multicomponent polymeric materials based on unmodified starchlike polysaccharide. As disclosed, the starch is plasticized by water, glycerol or both. The examiner points out that the reference discloses coating of particles of starch with silane in order to minimize diffusion that causes loss of dimensional stability, texture, and form. In examiner's view it would therefore be obvious to employ organofunctional silanes as disclosed in *Krishnan et al.* in the instant process/component.

Applicant has canceled claims 18-34 and submits new claims 35-57. New claim 35 is a new process claim setting forth the following process steps:

- a) providing an aqueous dispersion of polyvinyl acetate;
- b) adding a catalyst, selected from the group consisting of mono-hydroxy compounds, dihydroxy compounds, and trihydroxy compounds, to the aqueous dispersion;
- c) presaponifying the aqueous dispersion of polyvinyl acetate by adding an alkaline substance to the aqueous dispersion;
- d) providing an alkali silicate solution;
- e) reacting the presaponified polyvinyl acetate of step c) with the alkali silicate solution of step d) by adding, while stirring, the alkali silicate solution over a period of at least one hour to form organosilicates.

Claim 50 sets forth the following method steps:

- a) providing an aqueous dispersion of polyvinyl acetate;
- b) pretreating the aqueous dispersion of polyvinyl acetate by adding a catalyst, selected from the group consisting of mono-hydroxy compounds, dihydroxy compounds, to the aqueous dispersion;
- c) providing a solution comprising alkali silicate and an alkaline substance;
- d) reacting the pretreated polyvinyl acetate of step b) with the solution of step c) by adding while stirring over a period of at least one hour the solution of step c)

to form organosilicates.

The two methods as claimed employ an aqueous dispersion of polyvinyl acetate to which is added a catalyst (hydroxy compounds) and which is presaponified by adding an alkaline substance to the aqueous dispersion according to claim 35 or pretreated by adding a catalyst (claim 50). Subsequently, the presaponified or pretreated polyvinyl acetate is reacted with alkali silicate solution (containing according to claim 50 an alkaline substance), wherein the alkali silicate solution is added while stirring over a period of at least one hour to form organosilicates.

One of the decisive differences between the methods of the present invention and the method of the prior art is firstly the alkali silicate (water glass) is added as a solution to the reaction mixture of dispersed polyvinyl acetate, while in the cited prior art reference *Ritter* water glass is added in a dry powder form; see general description under the heading "Examples" and also Example 1 (a mix of solid water glass and calcium compound is added); Example 2 employs the same ingredients and steps as Example 1. Variations in the other examples concern only the calcium compound but in all examples water glass in the form of a solid compound and not in the form of a solution is used.

Also, the method according to claim 35 includes the step of presaponifying the polyvinyl acetate thus making available reactive sites for the subsequent reaction of the water glass solution.

The most important difference is that according to the present invention the compounds in the reaction mixture are allowed to react with one another for an extended period of time by adding the alkali silicate solution over a period of at least one hour. In this way, the water glass, which is in the form of a solution, making available the reaction sites of the alkali silicate, is allowed to react for an extended period of time with the presaponified or pretreated polyvinyl acetate. The extended reaction duration allows formation of organosilicates. In the cited art according to *Ritter*, solid water glass is added; and solid water glass does not easily dissolve in aqueous solution - preparing a water glass solution from solid silicate requires extended mixing and heating before actually the solid material goes into solution. Therefore, it is obvious that the short reaction time provided according to *Ritter* does not allow the water glass to go into solution and only minimal amounts will be actually available for reaction.

Moreover, it is clearly disclosed in *Ritter* that the water glass is not added as a

reactive component but is added as an inorganic filler for the purpose of increasing water resistance. See, for example, the Abstract, lines 1 and 2: "polyvinyl acetate-based multicomponent mixture ... in the form of a blend with a filler which is at least partially insoluble in water".

Also, the product obtained in Example 1 is described as having a rough surface. This indicates the presence of silicate particles as a filler and is further evidence that the silicate (water glass) does not go into solution.

The short reaction time of the prior art mixture in the extruder which is only within the range of 1-5 minutes neither allows the water glass to go into solution nor does it allow enough time for extended reactions to take place. In contrast, the present invention by adding the alkali silicate solution slowly to the stirred, presaponified mixture (claim 35) or pretreated mixture (claim 50) allows ample time for reactions to take place, and organosilicates can be formed.

It should also be noted that the processes are carried out in entirely different reaction vessels. *Ritter* employs an extruder in order to be able to mix the mainly dry materials; such extruders provide very great shearing forces. Intensive shearing is of course, required in order to provide a mixing action of the mostly dry components; intimate contact of the reaction partners is not possible because the materials are paste-like due to the low water contents. The present invention, on the other hand, employs a batch mixer with centrifuging gear causing much smaller shearing forces and, since all components are present in liquid form, an intensive mixing and contacting of the reaction partners is possible.

Therefore, claim 35 and its dependent claims and claim 50 are not obvious in view of *Ritter*.

The secondary reference to *Krishnan* relates only to organofunctional silanes and does not provide any disclosure concerning the method as claimed in claims 35 and 50.

Not only does the method of the present invention differ from that of the prior art, the product or component of the present invention produced by the method also differs.

Even though the similar ingredients are being used in *Ritter* and in the present invention, the first difference is that solids are being used in *Ritter* and not a water glass solution increasing the reactivity and the number of available reaction sites. Also, according to claim 35, the present invention employs a presaponification step making the polyvinyl

acetate ready for further reaction. Such a presaponification is not suggested or disclosed by *Ritter*. Moreover, the brief reaction duration of *Ritter* in combination with the use of solid water glass is a twofold obstacle for reactions between the water glass and the polyvinyl acetate to take place.

It is well known in chemistry and chemical engineering that the reaction conditions have a great influence on the outcome of a reaction - the reaction products are not simply determined by what is being put into a reaction vessel. Therefore, even though similar ingredients are being used, the outcome of a reaction between substances is controlled by the reaction conditions, in particular, whether a reaction is allowed enough time, whether the substances are in solution, etc. The respective concentrations in solution and numerous other parameters are also important. Given the great differences in the reaction conditions (primarily, a solution of water glass used according to the present invention versus solid water glass being added; a reaction duration of at least one hour according to the invention versus 1-5 minutes according to *Ritter*), the examiner's contention that same ingredients will lead to same products is unfounded.

Therefore, the product or component of claims 51 and 52 are not obvious in view of *Ritter*.

Claim 52 moreover sets forth that the component has a specific water contents and a specific pH value; neither one of these features is disclosed in *Ritter*.

The product according to *Ritter* is treated under vacuum to remove the water. Moreover, even the reaction mixture never contains water within the claimed range: Example 1 has only one aqueous component in the form of the aqueous polyvinyl acetate. The amount added is 2 kg of a 50 % dispersion; this means that 1 kg water is added. The total mixture is 7.5 kg so that the water contents is only 13 %.

The pH value of the component is of great importance. It is known in the art that pH values above 9 in the mixture for producing the thermoplastic starch (TPS) lead to discoloration of the final product, caused by decomposition of the starch, making the product unappealing to the consumer. The Example 6 of *Ritter* shows that the resulting product is brown, i.e., the composition must have a pH value leading to decomposition of the starch and discoloration of the product.

The inventive component which is to be used as an additive for producing thermoplastic starch polymers has a pH value outside of the critical range and thus leads

to desirable white products.

The claims 35-57 submitted with this amendment are believed to be allowable in view of the arguments presented above.

### **CONCLUSION**

In view of the foregoing, it is submitted that this application is now in condition for allowance and such allowance is respectfully solicited.

The instant amendment provides four independent claims and three claims in excess of 20. This requires the following fees:

1 x \$42.00 = \$42.00 for one claim in excess of three independent claims

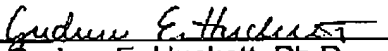
3 x \$9.00 = \$27.00 for three claims in excess of 20 claims

Please charge the required fees to USPTO Deposit Account 501199.

Should the Examiner have any further objections or suggestions, the undersigned would appreciate a phone call or e-mail from the examiner to discuss appropriate amendments to place the application into condition for allowance.

Authorization is herewith given to charge any fees or any shortages in any fees required during prosecution of this application and not paid by other means to Patent and Trademark Office deposit account 50-1199.

Respectfully submitted on May 27, 2003,

  
Ms. Gudrun E. Hockett, Ph.D.  
Patent Agent, Registration No. 35,747  
Lönsstr. 53  
42289 Wuppertal  
GERMANY  
Telephone: +49-202-257-0371  
Facsimile: +49-202-257-0372  
gudrun.hockett@t-online.de

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Encl.: new claims 35-57 (3 sheets)

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